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ABSTRACT

This handbook gives the historical background of a 2-year project conducted in a rural Wisconsin school district, outlining the planning and actual construction of a high school satellite receiving station. It is written to aid rural school districts in purchasing, installing, and using a satellite receiving station to improve the quality of education. Requirements for a satellite receiving system are given as well as information about locating a proper site, purchasing, installing, and using a system in the educational environment. Also included are sample lesson plans using satellite television programming materials available in the content areas of science, current events, foreign language, civics, and communications. Sections in this handbook include: "Getting to know the system"; "Where are the birds?" (satellite location); "Do you have a good site?"; "Basic system requirements"; "Purchasing a satellite receiving system"; "Installing the system"; "Putting the system to use"; "Sample lesson plans and observations"; and "From the desk of the instructional media specialist." Four appendices include: products mentioned in this handbook, final report, news release, and preliminary information on a satellite receiving station. (ALL)

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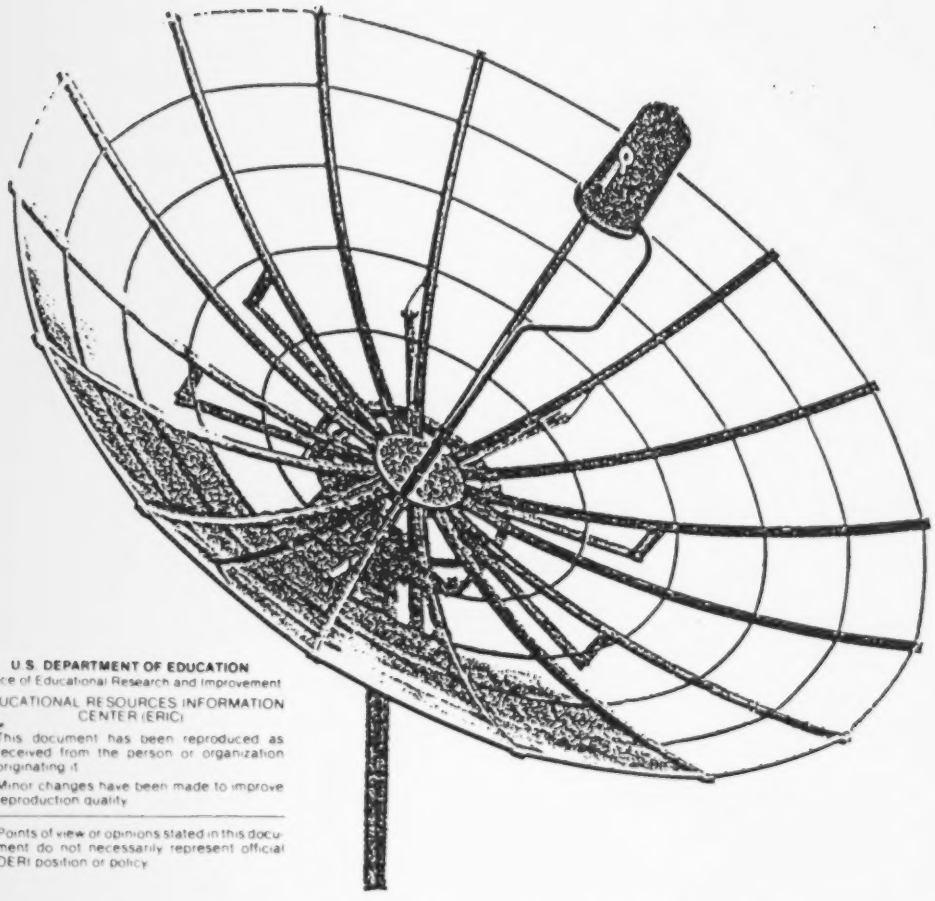

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For Rural School Districts

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Satellite Handbook
Chetek School District
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Chetek, WI 54728

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The Chetek School District wishes to thank the Conifer Corporation, 1400 Roosevelt, Burlington, Iowa, for their permission to use drawings and photos from their instruction manual and for the help given us over the phone while completing this project.

SATELLITE RECEIVING STATION

HANDBOOK

FOR RURAL SCHOOL DISTRICTS

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SATELLITE RECEIVING STATION FOR RURAL SCHOOL DISTRICTS

INTRODUCTION

Satellite communications technology has brought world news, education, and Entertainment to the most remote areas of this earth. People in very remote places of the world now have instant access to information that previously took days or months to acquire.

Rural school districts, particularly those having no access to cable TV, can and should take advantage of satellite communications. The equipment needed to receive satellite communications is well within the technical and budget limitations of small school districts. Satellite receiving stations are also easy to obtain and install. In most cases, installation can be done as school projects in which students become directly involved in communications technology.

Thousands of programs are available monthly on satellite television and radio transmissions. There are numerous educational, cultural, news, entertainment, and government channels from which to choose programming materials.

This handbook is written to aid rural school districts in purchasing, installing, and using a satellite receiving station to improve the quality of education. It will discuss the requirements for a satellite receiving system, locating a proper site, purchasing, installing, and using a system in the educational environment.

To further aid educators in using a satellite receiving system, the handbook includes several sample lesson plans using programming materials available on satellite television. Samples are shown for the areas of Science, Current Events, Foreign Language, Civics, and Communications.

Satellite communications seems very technical. However, the equipment on the market today makes it very easy to receive satellite signals from space. The technical aspects of satellite television are no more difficult than tuning a standard television with a hand held remote controller. Indeed, the technical complexities of satellite communications are transparent to the user.

Program materials from communications satellites can be very useful in a classroom. For those teaching a Spanish, French, or Japanese language class, satellite channels are available that use only those languages and also reflect the customs and traditions of the people of the respective countries. The broadcasts from the United States Senate can expose Civics and other Government classes to the people and events in Washington. Science classes have access to many science programs and spacecraft transmissions from N.A.S.A. Information concerning computers and computer applications are regularly broadcast. Communications classes can see first hand how news feeds are generated by national networks.

There are countless programs being broadcast each month. In fact, the information is so great it is very difficult for anyone to sort out the programs applicable to particular classroom

situations.

The satellite communications receiving system is a very worthwhile investment for rural school districts that have no access to cable T.V. or national network television. It is not difficult to find programming material for classroom use. All that is needed is time to sort through program guides, view taped material, and a teacher with imagination.

GETTING TO KNOW THE SYSTEM

A satellite receiving station is simply a system of mechanical and electrical devices capable of receiving and decoding signals from an earth satellite transmitter. The sole purpose of the receiving station is to gather and process signals from earth satellites. There is no capability to transmit back to the satellites.

Technology today is such that a simple satellite receiving station is well within the financial and technical reach of rural school districts. The cost is very reasonable in proportion to the programming available and a system is easy to install. The advantage of a satellite receiving station is that current, often real time, information can be made available to students and teachers in areas of the country that do not have access to cable T.V. or national network programming.

The basic satellite broadcast system (see figure 1-1) consists of a earth based ground to satellite transmitter, and a satellite to receive the earth based signals and relay the signals back to earth. These signals are then intercepted by the satellite receiving station, decoded, and sent to a television set.

The program material originates in a television studio. Program material is prepared and transmitted in the same way normal television signals are transmitted. The difference is that the signals are transmitted from a ground station to a

satellite located 22,000 miles out in space. The signal transmitted from the ground to the satellite is called the uplink signal.

The antenna onboard the spacecraft intercepts the uplink signal. The signal goes through a device that simply retransmits the signal back to earth. The device that accomplishes this is called the transponder. Most of the satellites have twenty four transponders. Thus, twenty four different channels of information can be transmitted by a single satellite.

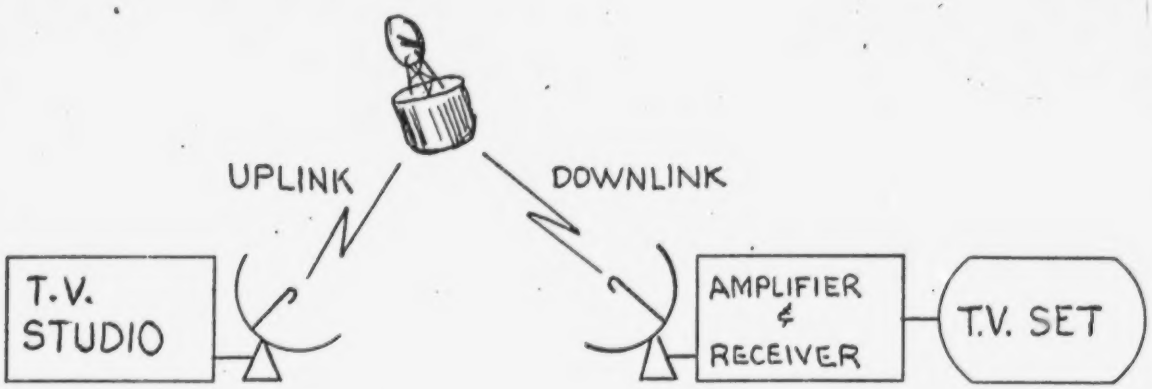

Figure 1-1. A typical satellite T.V. communications system.

The signals transmitted from the spacecraft are sent through the onboard antenna back to earth. The signal sent from the spacecraft to the ground is called the downlink signal. The satellite sends twenty four different signals back to earth, one for each transponder. The signal transmitted from the spacecraft spreads out over a considerable area as it travels the twenty two thousand miles back to earth. The pattern formed by the signal on the surface of the earth is called the footprint and may cover

the entire United States. Figure 1-2 shows the footprint of a communications satellite.

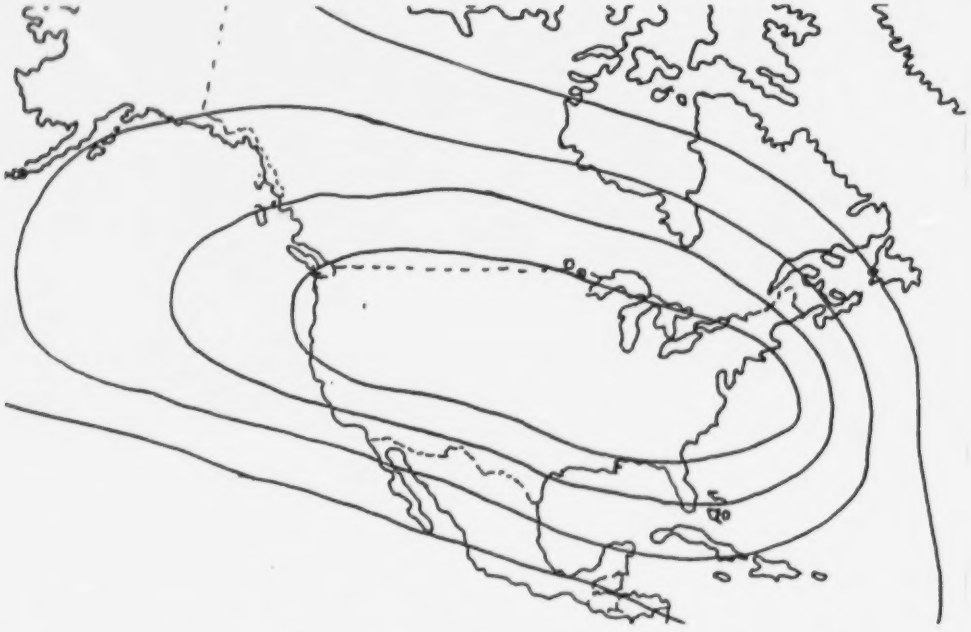

Figure 1-2. Communications satellite footprint.

The satellite receiving station intercepts the downlink signal, amplifies it, and sends it to a standard television set. The receiving station uses a parabolic dish antenna to capture the very weak satellite signals. These signals are so weak that they cannot be received by a regular television antenna. An amplifier is used to amplify the signals before they enter the satellite receiver. The receiver conditions the signals so that a normal television set can receive them at the antenna connection just as if they were being received from a earth based television station.

Since the satellites are located at different places in the sky, the parabolic antenna of the receiving station must be able to point to different places to find a particular satellite.

Some parabolic dishes are pointed manually and some are fully automatic.

The satellite receiving station is what this handbook is all about. The remainder of section text will discuss the parts and function of the satellite receiving station.

THE RECEIVING STATION COMPONENTS

The components of a typical satellite receiving station are shown in figure 1-3. The largest of the components is the parabolic reflector. This is the large round dish type structure and is referred to as the "dish".

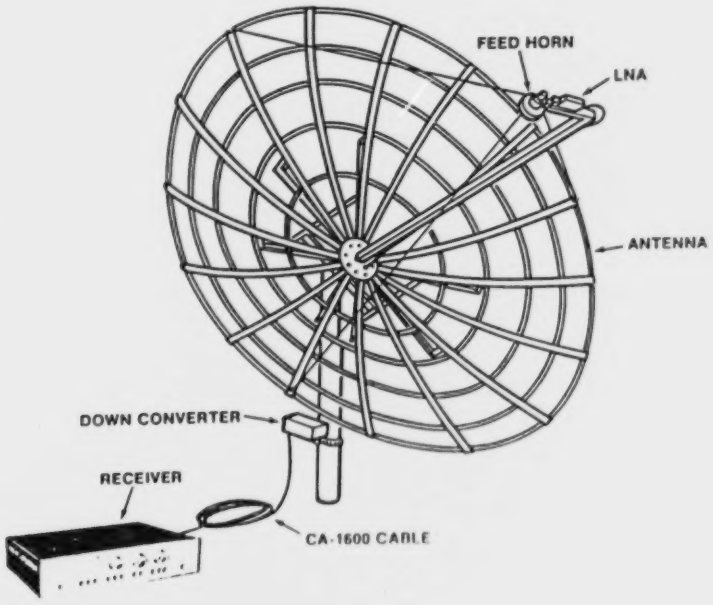

Figure 1-3. A typical satellite receiving station. (Conifer Corporation)

The parabolic reflector works the same way as an automobile light. Automobile lights have a bulb located at or near the focal point of the parabola shaped reflective surface as shown in figure 1-4. In this case, the

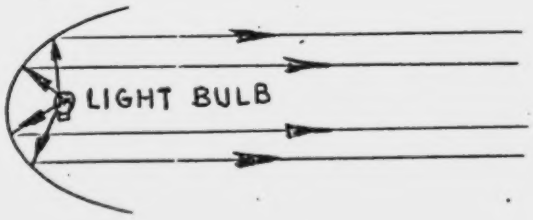

Figure 1-4. The parabolic reflector in an automobile light.

light source is placed at the focal point of the parabola and the light rays travel in a parallel path away from the parabola. The parabolic reflector antenna works just the opposite. The downlink signal from the satellite can be assumed to be entering the reflector in parallel rays. The parabola shape causes the signals to be gathered at the focal point of the antenna as shown in figure 1-5.

To capture the downlink signals, a feed horn is placed at the focal point of the parabolic dish. The feed horn then directs the signals into a LNA which stands for Low Noise Amplifier. The feed horn collects signals from only one direction thus reducing interference from other sources.

The function of the LNA is to amplify the signal from the earth satellite. This amplifier multiplies the weak signal from the spacecraft by a factor of ten to the fifth power. This is like having a microscope magnifying an object ten thousand times.

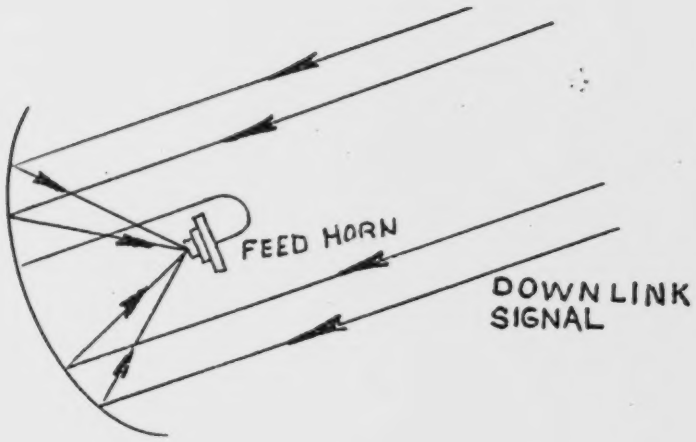

Figure 1-5. The parabolic reflector collecting signals from space.

The frequency (cycles per seconds) of the downlink signal is such that a television set cannot receive it. The frequency of the downlink signal is about four giga-hertz. This is 4,000,000,000 cycles per second. The television will receive signals on the order of 70,000 cycles per second. The down converter reduces the high frequency signal of the downlink to a frequency compatible with television sets.

The signal travels from the antenna system through a cable to a special receiver. The receiver processes the signal to a final form which can be used by a television set. It also contains antenna pointing electronics, transponder selection, and signal strength indicators. The receiver is connected to the antenna terminals on the television set.

Of course, all this happens at the speed of light. In other words, the signal leaves the earth transmission station, is received at the satellite, retransmitted back to earth and

received at the parabolic dish in a matter of two tenths of a second.

WHERE ARE THE BIRDS?

The communication satellites used for television broadcast are placed in what is called a geosynchronous orbit. This means that each satellite travels in its orbit so that it appears to be fixed above the earths surface. This is accomplished by increasing the radius of the satellite orbit until the length of time required to complete an orbit is twenty four hours.

To get a better feel for this type of orbit, think of the manned space missions. Each orbit around the earth takes about ninety minutes. The height above the earth for this type of orbit may be 100 to 200 miles. Obviously the manned spacecraft will travel around the earth some 16 times in a 24 hour period. Since the earth is rotating once each 24 hour period, the space craft will not fly over the same place from one orbit to another. If the height of the orbit, thus the radius, were to be increased to 5000 miles, the spacecraft would take much longer than ninety minutes to make a complete orbit. It would also make much fewer orbits in a 24 hour period.

At an orbital distance of 22,000 miles from the center of the earth, a satellite will complete one orbit in a twenty four hour period. Since the earth makes one rotation in a twenty four hour period, the satellite will appear to be stationary above the surface. The area in space, 22,000 miles out, where geosynchronous satellites are placed is known as the Clarke Belt. Figure 2-1 shows a portion of the Clarke Belt for some of the common U.S. and Canadian satellites.

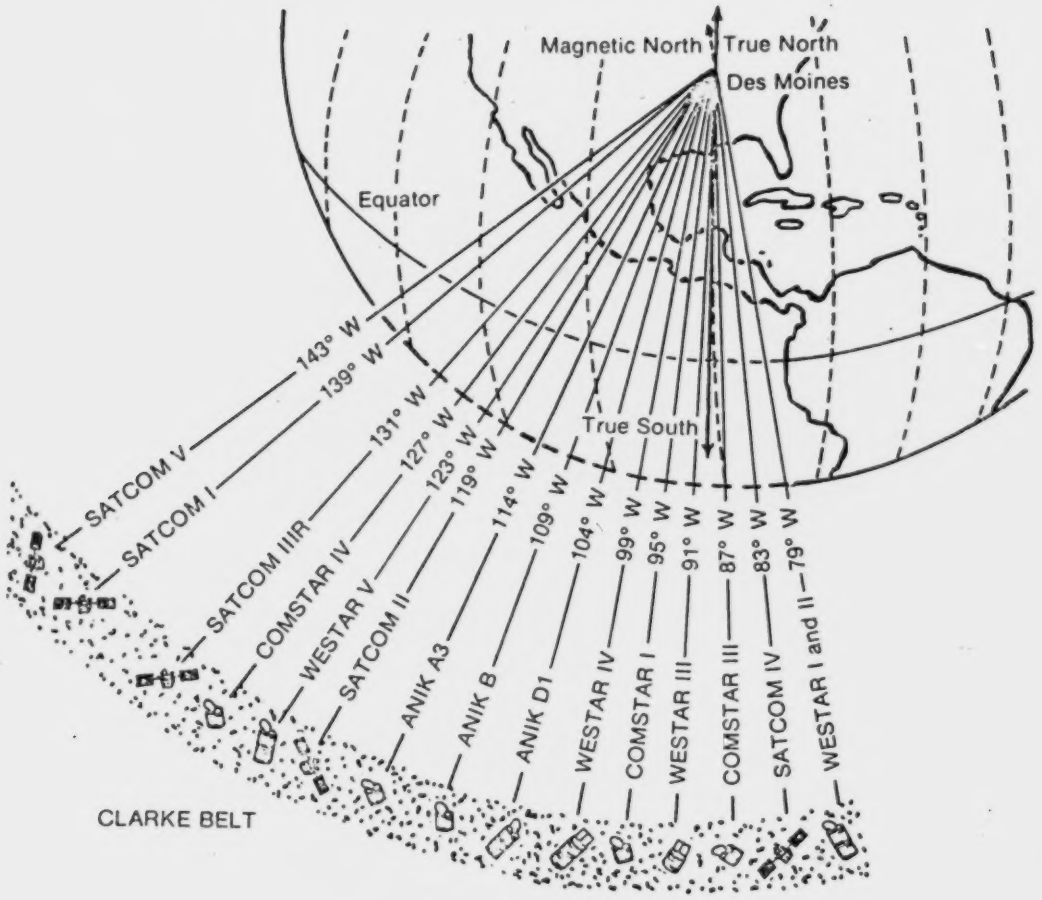

Figure 2-1 The Clarke Belt
(Conifer Corporation)

The Clarke Belt can be located from the Northern hemisphere by facing due South and looking up approximately 40 to 45 degrees from the Southern horizon. A good way to approximately locate the belt is to face due south, stretch your arms out in front of you and raise them so they are half way between the horizon and straight over head as shown in figure 2-2a. The imaginary arc

Figure 2-2A. Placing the arms approximately 40 degrees up from the horizon.

formed across the sky by moving the arms so they stretch straight to the right and left is the approximate location of the Clark Belt as shown in figure 2-2b.

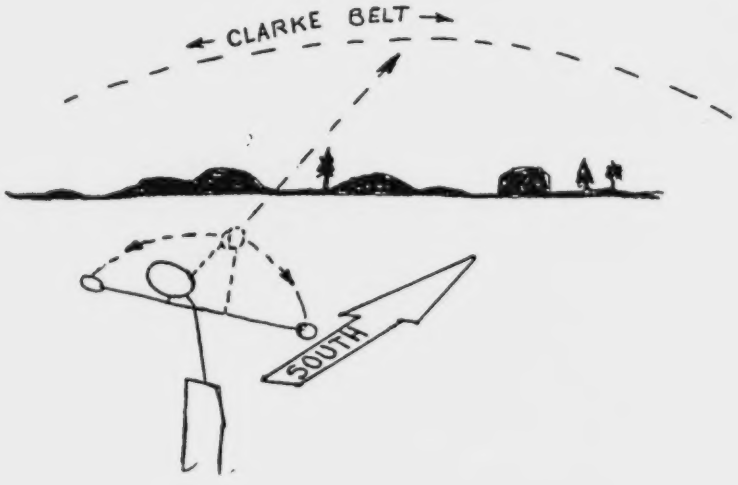

Figure 2-2B. Swinging the arms to east west makes an arc approximating the Clarke Belt location.

Locating satellites in the sky

There are a few terms that you should be familiar with when working with earth satellites. The first term is azimuth. Refer

to figure 2-3 in the following discussion. Azimuth is the measure of an angle relative to North. An azimuth of zero degrees refers to due North. An azimuth of ninety degrees refers to due east, 180 degrees due south, 270 degrees due West, and 360 degrees is the same as North. The term elevation refers to the angle above the local horizon. An elevation of zero degrees means that you are looking at the horizon. An elevation of ninety degrees means that you are looking directly over head.

Any location in the sky can be expressed in terms of azimuth and elevation. A satellite located at an azimuth of 180 degrees and elevation of 40 degrees would be located due South and at an angle of 40 degrees up from the local horizon. The terms azimuth and elevation are used to describe the location and pointing angles for various communications satellites.

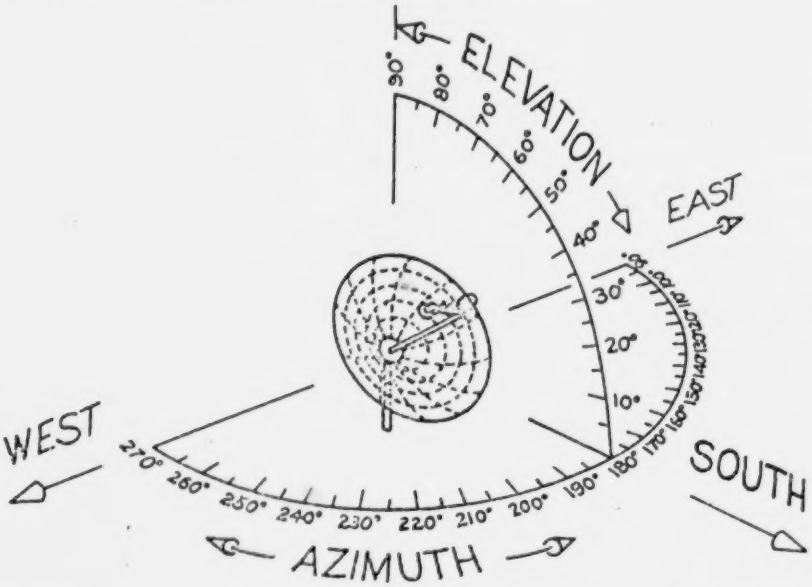

Figure 2-3. Azimuth and elevation coordinates. (Conifer Corporation)

Naming the satellites

Each satellite has a name and an abbreviation used to

identify it. Figure 2-4 shows the location and names of some of the satellites visible to the United States. Note that each satellite has a name and number, like Westar I. The number is used to distinguish similar satellites. For example, Westar I, Westar II, Westar IV, and Westar V are similar satellites but are located at different places in space. Table 2-1 lists the current satellites and their locations in azimuth.

Name	Common abbreviation	Azimuth
SATCOM F1R	F1	139
GALAXY 1	G1	134
SATCOM F3R	F3	131
TELSTAR 303	T3	125
WESTAR 5	W5	122.5
SPACENET 1	S1	120
MORELOS 1	M1	113.5
ANIK D2	A2	110.5
ANIK D1	A1	104.5
WESTAR 4	W4	99
TELSTAR 301	T1	96
GALAXY 3	G3	93.5
WESTAR 3	W3	91
TELSTAR 302	T2	86
SATCOM F4	F4	83
GALAXY 2	G2	74
SATCOM F2R	F2	72

DO YOU HAVE A GOOD SITE?

Before considering the purchase of a satellite receiving station a suitable site must be located so the satellites are visible. In other words, are there obstacles, such as trees or buildings that would interfere with receiving the signals from the satellites. If there is a dealer near the school who sells satellite receiving equipment, consider having a site analysis done. The following discussion will aid in making a site evaluation.

There are several items to consider in choosing a proper site for the receiving station dish. Perhaps the most important is the visibility of the Clarke Belt from the proposed site. The best way to find out is to obtain a compass with a scale and an inclinometer (a device that measures inclination) similar to that shown in figure 3-1. This device can easily be made from a protractor. Simply tie a fishing sinker to a string and attach it to the center of a protractor. Site along the base of the protractor and raise it until the the desired inclination angle is reached.

The compass will measure the azimuth and the inclinometer will be used to measure the elevation. To evaluate a possible location for the dish, use the compass to determine magnetic north then turn around and face 180 degrees in azimuth. This is magnetic south. Using the inclinometer, or estimating, point up from the horizon approximately 30 to 40 degrees. Then look to the horizon in the eastern and western sky. Check to see if there are any obstructions that would prevent you from "seeing"

the satellites from the possible site. If there are no obstructions, a possible site exists. If there are trees or buildings that interfere with seeing satellites in this part of the sky, try to find a better location.

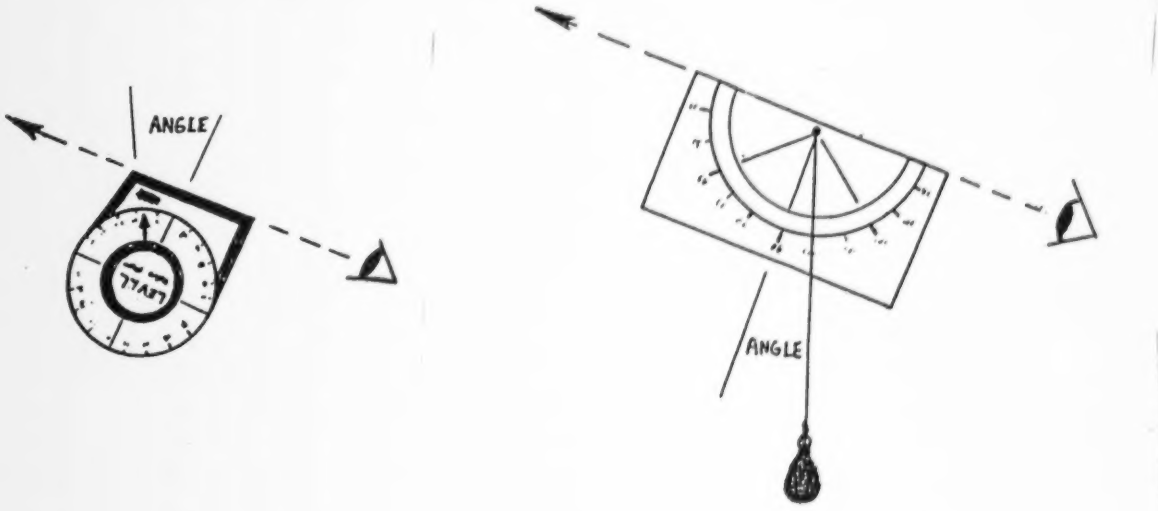

Figure 3-1. A simple inclinometer.

There are other considerations in choosing a location for the satellite dish. In addition to being able to clearly see the Clarke Belt, the physical conditions at the sight must be considered. The parabolic dish must have a very solid mount. There should be a fairly level place to set a pedestal on which the dish is mounted. The location should be such that vandalism will not be a problem or a fence should be placed around it if there is a danger of vandalism.

The distance the site is located from the receiver is also a key factor in choosing a site. If the cable run from the dish to the receiver is too long the signal may become too weak due to the resistance in the line. The distance from the dish to the

receiver should be less than 200 feet.

Another item to consider before erecting the satellite receiver dish is the location of microwave transmissions in the general area. If the site is located very near or directly in the path of microwaves, the signal may be impossible to receive or special filters may have to be added to the satellite receiver. The best way to check on microwave paths is to inquire at the local telephone company and get a map showing where their microwave stations are located. Compare the proposed site location on the map to possible microwave paths. If the microwaves pass over the proposed site, choose another location by having a dealer use a portable dish.

Electric power lines may be another problem. High voltage power lines may also cause interference with the signals from space. The site should not be close to or "looking through" power lines to receive the satellite signals.

One sure way to know if the site is suitable is to have a local dealer come out with a portable dish to see if the signals can be received. Some dealers have a unit that fits on a trailer that can be set up on the proposed site. If the signals cannot be received by the portable dish, it can be moved about until a suitable location can be found.

BASIC SYSTEM REQUIREMENTS

Once it is determined that a good site exists for the satellite receiving dish, some basic requirements for the system should be established. By properly specifying system options a satellite receiving station can be tailored to district needs. Defining specifications will also aid in getting bids from various sales representatives. It is also undesirable to spend money on options that are not really necessary.

Who will install the system

Before purchasing a satellite receiving station, a decision must be made concerning who will be installing the system. If the system is to be built as a project for a shop class, the abilities of the students and staff, to erect the dish and electronically hook up the system must be considered. A dish makes an excellent project for a Metals Fabrication class or a class in Construction Techniques. It is also possible to get some Mathematics students and teachers involved in determining pointing angles when aligning the dish. If the system is to be installed by a local dealer, the construction requirements are secondary.

Who will use the system

When evaluating satellite receiving stations, keep in mind the technical abilities of the people who will be using the equipment. If the school system has a full time audio visual specialist, a system that is technically oriented may be fine. However, if classroom teachers will be operating the system, a

simple non-technical system is in order. The best rule is to keep the system as simple as possible so that it is easy to learn to use. If the system is too complex, few will use it.

If students will be using the system, the equipment must be sturdy enough for daily student use. Students tend to have less appreciation for the delicacy of some electronic equipment. Equipment that has controls and switches that can stand repeated student use must be a requirement in this case.

The primary use of the receiving station should be considered also. Some questions that must be asked are:

Who will be using the system? (Elementary, Secondary, etc.)?
What satellites signals are most used?
What kind of access is required?

Deciding who will be using the information is important in determining the size and pointing range of the parabolic dish. If elementary teachers will be the prime user, a smaller dish that will receive the educational channels on the strong satellites will suffice. On the other hand, if the science department in the secondary school wishes to receive the NASA mission transmissions, a dish that points to a low elevation and has an excellent signal gathering capability may be necessary.

It may be difficult to determine who will use the information without knowing what information is available. A good place to find out what is on the satellite stations is to read some of the magazines, such as ORBIT (see appendix A), that publish satellite television guides. Browsing through some of these guides, will aid in determining who in the school system

would be interested in using the information. The subject of satellite television guides is also discussed in section eight, Putting The System To Use.

As the satellites grow older their transponder signals tend to weaken. If some of the transponders needed to meet user requirements are weak, a larger diameter dish will be needed. Perhaps the best place to find out about weak transponders is a local satellite T.V. shop.

Community organizations might be another group of users. Police and Fire Fighters may have occasion to use special programming available on the satellite broadcasts. If this possibility exists, check with the local satellite station dealer to see if these programs require a larger dish.

What size dish?

Satellite antennas vary in size according to the diameter of the parabolic dish as shown in figure 5-1. The most common size today is six to twelve foot in diameter. The size will depend upon the requirements for receiving particular satellites and transponders. If students are installing the system, a large diameter dish is recommended. The large size allows for more error in pointing the system in addition to picking up the weak transponders.

If requirements call for a few of the more powerful satellites, an eight foot diameter dish is fine. The availability of space at the site chosen for the dish may also dictate a smaller diameter dish. If the dish is to be mounted on a building, check the blue prints for the best mounting location.

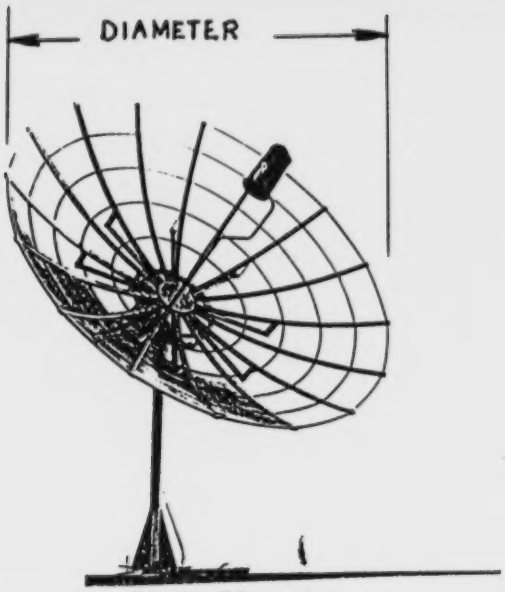

Figure 5-1. Measuring the dish diameter.

Keep in mind wind factors when mounting the antenna on a roof. The wind can cause large forces to be transmitted to the structure through the mounting base.

Choosing a receiver

Receivers for satellite T.V. come an various types. Simple single function receivers as well as multifunction types can be purchased. Some receivers pick up stereo broadcasts, both audio and television. Others will automatically point the dish to a particular satellite.

There are some basic functions that should be kept in mind for school systems. To keep the use of the receiver as simple as possible for staff members, it is advisable to have a receiver that automatically points to a particular satellite. This is a valuable time saver to those using the system. Once a receiver is set up, all the user has to do is press the satellite number on a key board, similar to a T.V. remote control, and the dish automatically moves to the proper position. Without the

automatic pointing, the user has to scan the antenna until the proper signal is obtained while watching an indicator on the receiver panel. This takes time and requires constant monitoring while scanning the dish.

The need for a descrambler

Some of the channels on the satellites are scrambled. This means that the signal is present but in a form that makes the picture impossible to see. Many stations are now scrambling their signals to prevent unauthorized users from receiving and using programming material. If this type of signal is required, a descrambler will have to be purchased. This device attaches to the receiver and decodes the signal so that it is visible. In addition to the cost of the descrambler, there is usually a monthly subscription fee to pay for the programming material. Some modern satellite receivers have a built in descrambler. Care should be taken when purchasing a descrambler. If the station transmitting the signal changes the decoding scheme, the descrambler must be modified to work with the new scheme.

Have a VCR and monitor for recording

A T.V. monitor and VCR (Video Cassette Recorder) are a certain requirement in addition to the receiving equipment. There is so much information on the satellite channels that a recording device is necessary to allow teachers to preview program material on their own time schedule. The recorder should have a timer system that can record four or more different programs in a twenty four hour period. It is important that this equipment be dedicated to the satellite T.V. system. There should be plenty of blank recording tape available and a method

of filing and storing the tapes is also required.

PURCHASING A SATELLITE RECEIVING STATION

Purchasing a satellite receiving station is a rather sizeable investment. It requires a little shopping and comparing of both system components and dealers. An excellent receiving station can be purchased. However, if the support given by the dealer is unexcceptable, it could discourage use of the system.

Choosing a dealer

There is ample literature available about buying, building, and installing a satellite receiving station (See appendix A). When purchasing a system, look for a dealer that is very knowledgeable in the area of satellite receiving stations. Not only should the dealer have a knowledge of a receiving station, he should be very knowledgeable about what is available on satellite T.V. and which space craft are visible in your area. He should know about the location of the Clarke Belt and where the various satellites are within it. He should be up to date on which transponders are weak on various satellites and what the future may hold for satellite T.V.

The dealer should have a good reputation. Take advantage of the local Better Business Bureau and check for complaints against a dealer. Visit with people who already own a satellite receiving station. Ask them about the support given by the particular dealer they purchased from. Visit the dealers shop. If there is a messy shop, there may be messy installations.

Perhaps the most important thing to check on a dealer is how well he can service the components of the system. Some dealers

will fix components at their shop while others will send the components to an outside facility or service area. Remember that a system may be down for several weeks if the dealer has to sent the equipment out of town. The dealer should also be willing help if there are questions and problems operating the system. If the dealer isn't available, there should be a factory phone number to call.

Considering the cost

The cost, of course, will be a major factor in purchasing a satellite receiving system. When talking to a dealer about price. The list of requirements made earlier should be used as a basis for defining the system. Having this list has two purposes. First, it aids in remembering what the basic needs of the system are, and second, pricing can be done on nearly identical features. It is often difficult to do a price comparison when each dealer is quoting a price on different components and features.

Another factor to consider in pricing a system is what items are included in the basic price. Does the quote include such things as installation, travel, cables, and a base for the dish? Each dealer may cost a system in a different way. Be sure to document included and excluded costs for each dealer when comparing system prices.

The warranty offered on a system is important and should be carefully considered. There may be separate warranties on the parabolic dish and the receiver. The dish may have separate warranties on the drive motors and the dish structure. Some warranties include labor and others parts only. If the dealer

must ship a component back to the factory the cost of shipping may be the responsibility of the school district.

The dish should have a minimum of one year warranty its surface and shape. Any electronic components should have a minimum 90 day warranty. Usually, electronic components will fail within a three month period if they are going to fail at all. In a school system purchase, be careful about buying a system to be installed in the spring. The 90 day warranty coverage would then be applied over the summer months when the system may be in little or no use. Try to install the system just before school starts so that it will be used heavily during the first 90 days.

Dealer installations

If a dealer is doing the installation, there are a few items that should be monitored carefully. Building the foundation is the first visible aspect of the system installation. The foundation the parabolic dish rests upon must be very sturdy. Remember that wind forces are going to tend to move the dish. The foundation should be cemented into the ground and must be perfectly vertical.

Check with local Utility Companies to insure that a hole can be dug at the site without the danger of hitting electric cables, phone lines, or natural gas lines.

The pipe that supports the parabolic dish should be protected from rust by a generous coat of paint. The cement used in the foundation should not protrude above the ground so that grass can be mowed next to the mount. The dealer should leave the foundation area neat and clean.

All local and national electrical codes must be followed during the installation. Electrical connections should be neat and strong. Watch for wires that may be rubbing on metal near the drive motors on the dish assembly.

The assembly of a typical system may require several days due to the time it takes cement to cure and the alignment procedures. It is a good idea to try to hold the dealer to a time schedule to insure that things don't drag out too long.

When the installation is complete, the dealer should perform a walk around the system pointing out the items that may require

maintenance or special attention. There should be ample instruction on the operation of the receiver and pointing methods. Finally, as mentioned earlier, there should be a phone number to call if a problem should occur.

School project installation

Doing the installation at school using classes is an excellent way to expose the students to modern technology. Machine Assembly, Metals, Electronics, Physics, or Trigonometry classes can be involved in the assembly of the system. The best type of parabolic dish to use for student assembly is a wire mesh type with several panels. Figure 7-1 shows an excellent parabolic dish for student assembly. This particular dish has

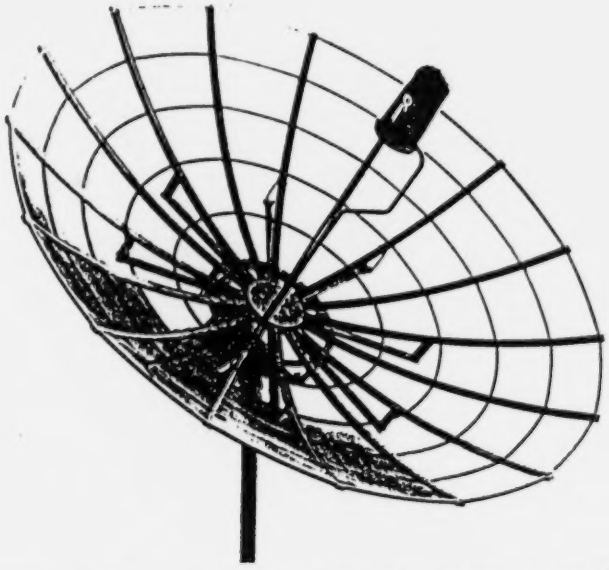

Figure 7-1. A dish for student assembly.

sixteen individual panels to assemble and is manufactured by Conifer Corp (See appendix A). For the students to get the maximum benefit from a project such as this, they should be allowed to read and follow the directions in the instruction

manual with very little help from an instructor. The instructor should be there for guidance only. This gives the students first hand experience at assembling a rather complicated device from plans and instructions provided by a manufacturer.

The dish at Chetek High School was assembled by a Metals class. The dish assembly was mounted on the gym roof and required the design of a special base that would hold the antenna mount for the dish. After checking with our local roofing contractor, a corner mount was designed. Welding was done by students in the Welding class. Figure 7-2 shows the corner mount used at the Chetek installation.

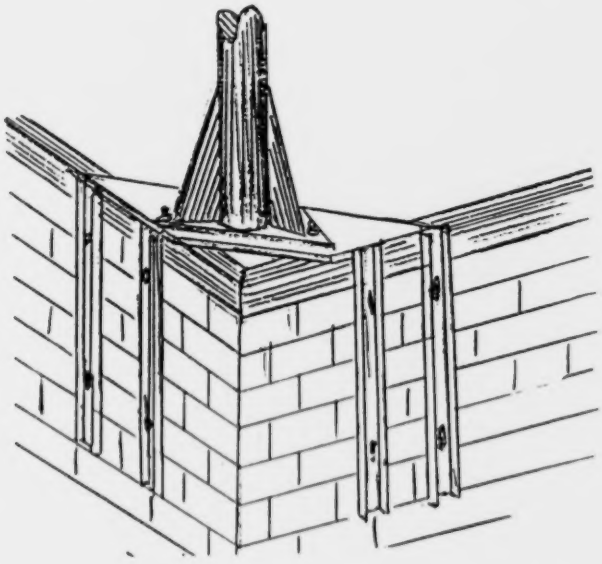

Figure 7-2. Corner mount for dish.

After the base was assembled, it was lifted to the roof by our local roofing contractor who donated the time and materials required. Figure 7-3 shows the class lifting the parts of the dish on to the roof. The students then assembled the dish on the roof mounting.

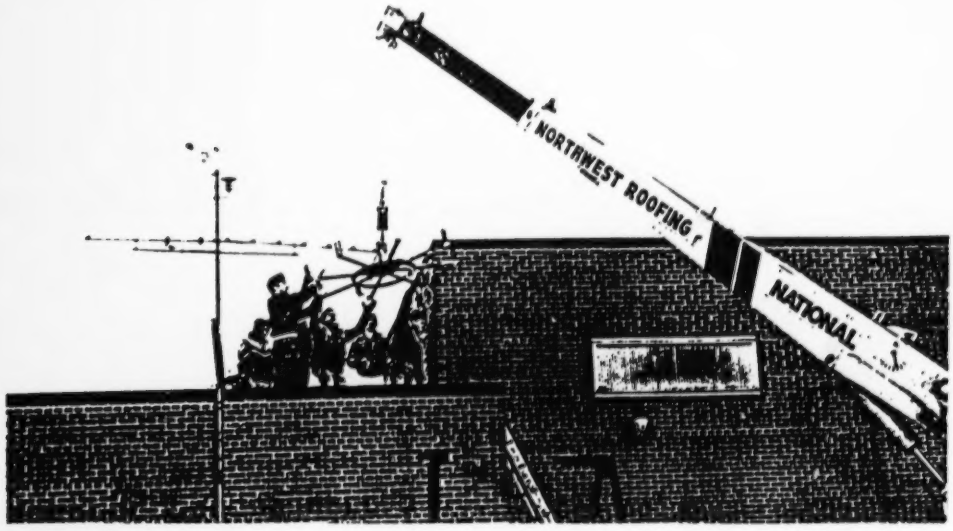

Figure 7-3. Class lifting components to the roof.

The most difficult part of installing the system is aligning the dish to the Clarke Belt and finding all of the satellites. It is quite easy to find a single satellite. However, it takes many tries and small adjustments to be able to receive all the satellites with good clear signals.

The alignment procedures will require an inclinometer, as shown in figure 3-1, and a compass with degree markings. This procedure requires excellent instructions from the dealer or manufacturer. Basically, you will have to complete the following steps:

1. Align the dish axis to true north. This is accomplished using a string and compass. The compass is pointed to magnetic north and the dish mounting adjusted for true north.

2. Point the parabolic reflector (dish) towards the Clarke Belt.

3. Locate the pointing angles of a strong satellite and point the dish towards this satellite.

4. Scan the dish through the Clarke Belt until a signal is received.

5. Once a signal is received, scan the dish to see if other satellites can be detected.

6. Adjust the pointing on the dish until all the satellites can be received from East to West.

7. When all satellites are received, lock the pointing positions of the dish and make final connections to receiver and dish pointing hardware.

This procedure is best carried out when the weather is warm and there is little wind. It is easiest if a portable television and the satellite receiver are taken to the site where the dish is located. This way the signals can be observed as they change with the pointing of the dish. This process takes time and patience. It is beneficial for a small group of Trigonometry students (approximately 3 or 4) to help in the alignment procedure. Here they will get a feel for working with angles and relating them to the earth/space environment.

Each satellite system will have its own pointing procedures depending on the type of mount used for the dish. This procedure

requires very accurate and easy to follow directions. Here is where a larger dish comes in handy. The larger dish will receive signals from a satellite even if the pointing is inaccurate. The adjustments that have to be made once a signal is picked up are very small and may require several hours to perform.

The satellite receiver is also being checked out as alignment is performed. The signal strength meters can be used to estimate the strength of the signal as the dish is being scanned to the various positions in the sky. The scanning direction and pointing positions can be checked as the dish is pointed to various satellites. Once the dish has been aligned, it is scanned from east to west and the signals are monitored as each satellite is received.

To verify the reception of all the satellites, use a program guide to compare the programming being viewed with the satellites. For example, if a channel 4 has an educational program on it, check the program guide and match the program being viewed to a satellite near the angles the dish is pointed. When satisfied that the programs being viewed match a particular satellite, note the dish position and proceed to find another satellite by scanning to another position to the east or west. More will be said about this in the next section.

PUTTING THE SYSTEM TO USE

After the system is installed and aligned so that all the satellites are being received, the program material can be explored to see what may be applicable to the classroom. This process will be interesting and may take considerable time because of the many satellites and transponders to monitor.

It is difficult to know what satellite is being received just by scanning the dish to a strong signal. There are few indicators that are regularly broadcast that identify a satellite and transponder like radio or television based on earth. Obtain a current copy of a satellite T.V. programming guide, such as ORBIT magazine, to get information on what satellite and transponder various programming is located.

One way to monitor what is available is to start with the most eastern or western satellite and work across the Clarke Belt checking out each satellite as you go. For example, start with Westar I & II, as shown in figure 8-1, checking each transponder or channel to see what is being transmitted. Note each transponder that has a potential of being used in a classroom situation. When finished with one satellite go on to the next easterly or westerly satellite and repeat the procedure. This gets rather involved as there are some sixteen satellites each having twenty four transponders or channels. That's a total of 384 different channels of broadcast information to monitor.

Obviously, it will take a lot of time spending just ten minutes on each channel. The best way to check out what is

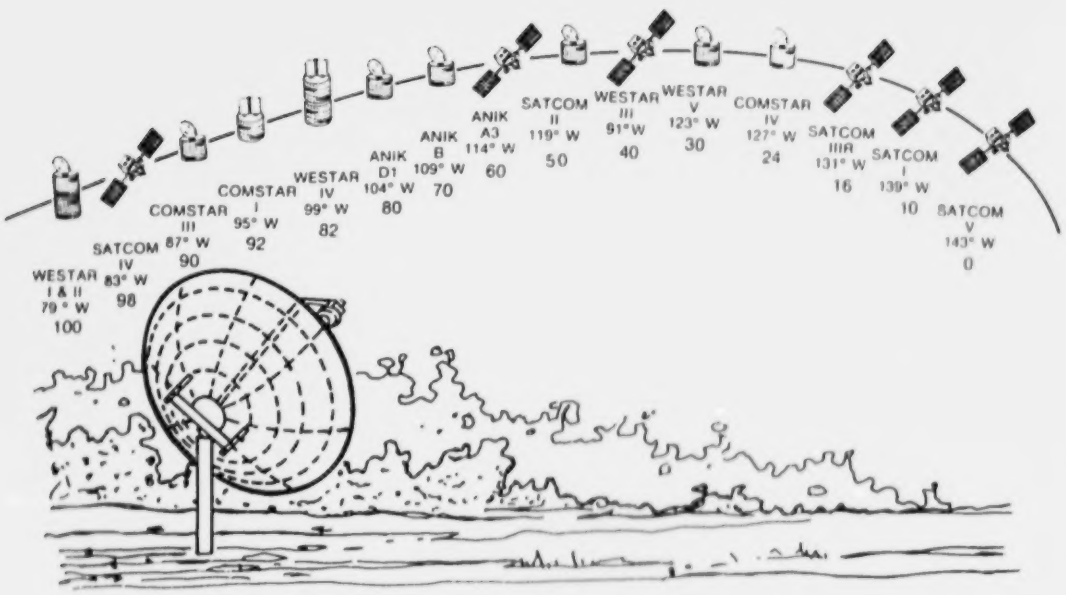
WESTAR I & II 79° W 100
SATCOM IV 83° W 98
COMSTAR III 87° W 90
COMSTAR I 95° W 92
WESTAR IV 99° W 82
ANIK D1 104° W 80
ANIK B 109° W 70
ANIK A3 114° W 60
SATCOM II 119° W 50
WESTAR III 91°W 40
WESTAR V 123° W 30
COMSTAR IV 127° W 24
SATCOM IIIR 131° W 16
SATCOM I 139° W 10
SATCOM V 143° W 0

Figure 8-1. Satellite locations from East to West (Conifer Corporation)

available on the satellites is to subscribe to a satellite television programming guide. These can be purchased at any store that handles magazines. These magazines have listings of all the programming available on the satellites just as a TV Guide would. The only difference is that there is so much more program material to report. These magazines have very helpful listings of program material by category. They have special sections devoted to such areas as movies, news programs, network specials, sports, business, etc. Daily programming is listed in the same manner as conventional television listings in a newspaper.

These magazines also include other programming material that is available on satellites. Some satellites broadcast computer programming material, audio transmissions, such as background

music, and various stereo music channels. There are also listings of programming material available on very high frequency satellites known as ku-band.

The procedure used in identifying a particular satellite is as follows:

1. Scan the dish to the most easterly or westerly satellite position. Tune the receiver to a channel with a strong signal. Check the program material found in a satellite T.V. programming magazine to see if it matches anything on the monitor. For example, the channel being viewed may be broadcasting an educational program. Check the program listings for the satellites near this eastern or western location that are broadcasting educational programs during the time period being viewed.

2. When the program being viewed on a given channel matches the scheduled programming of a satellite in the T.V. guide, note the location of the satellite with respect to others and the name of the satellite. Write this down on a piece of paper. The location of the satellite on the receiver panel should also be noted - usually a number from 0 through 90 is used to represent the location of satellites.

3. Repeat this procedure until each satellite is identified and the corresponding numbers presented on the receiver display are recorded. If a programmable remote control or programmable receiver is used, program it to allow users to simply input a number that

corresponds to a particular satellite so the dish will automatically scan to the correct position. All the user has to do is find the correct channel and they are ready to view the program.

Finding programming material for use in the classroom can be a frustrating task. The frustration comes from the fact that there is so much material to sort through. Just finding programs that would be of interest in the classroom using satellite T.V. guides takes a large amount of time. There is so much programming material available in particular subject areas that one must be prepared to spend time reviewing program summaries and or recorded video tapes of the programs desired.

Since there is so much material to be sorted in order to find applicable classroom programming, it might be wise to have someone in the district responsible for flagging programs of interest to various subject areas. This person should be given time to review satellite T.V. guides and make a monthly listing of programs that may be of interest to classroom teachers. If the satellite receiving station is used by elementary and secondary school within a district, there should be a person in each area to review guides and make lists.

SOME SAMPLE LESSON PLANS AND OBSERVATIONS

This section of the handbook contains some sample lesson plans designed by teachers who have used satellite T.V. programming materials in class. The lessons are designed for Communications, Spanish, Civics, Science, and Middle School Government.

It should be noted that all teachers using the satellite programming material have the same concern - there is too much information to review. Teachers must be very selective about what they have recorded and the time spent reviewing material.

The potential for educational program material is extremely great. However, if some method of sorting programs applicable to a given class is not found, the potential will not be realized. What is needed is an educational programming clearing house that reviews and recommends educational satellite television material for different subject areas.

There is potential for many subject areas other than those discussed in this handbook. For example, the audio channels should be explored for Music Appreciation classes. There are many channels that broadcast classic plays and movies that may be helpful to a drama class. There is much material concerning computers and computer applications that would be applicable to Computer Science classes. Economics and marketing classes may want to take advantage of Stock Market information and various T.V. sales methods seen on satellite T.V.

USING SATELLITE BROADCASTS IN COMMUNICATIONS CLASS

Diane Fjelstad

Communications Instructor

Chetek High School

Some thoughts on satellite communications

The satellite dish is helpful in the television unit of Communications class by giving students the opportunity to view a wide range of programming otherwise not available in Chetek, especially programming from other countries.

The positive and negative aspects of using satellite communications are closely related; there's so much material available that searching through the program lists is a formidable task.

I have found it worthwhile to have the media director (or student assistants) tape programming for me and briefly describe the programs' content and list the video recorder counter numbers so I can tell how long the programs last and where they are on the tape. This makes previewing easier for me. For instance, our audio visual director taped one morning of broadcasting from Canada of which I used 30 minutes. I was able to give students a sampling of the programs, news, preview, commercials, etc. from Canada.

SAMPLE LESSON PLAN USING SATELLITE COMMUNICATIONS

COMMUNICATIONS CLASS

Diane Fjelstad

Communications instructor

Chetek High School

Objective :

The overall objective of this unit is to give students a view of television broadcasting from another country. After viewing samples of television programming material from, for example, the Canadian communications satellite, the students will be able to write a comparison of Canadian television and American television.

Class time required:

Class time needed to cover the four sections of sophomore Communications classes would be four class periods.

Preparation time required:

Teacher time required would be one to two hours to check program guides and about an equal amount of time to preview the tapes to decide what material to use.

Materials required:

Video tape recorder, tape, and television monitor.

Preparation:

Tune the satellite receiver to one of the Canadian satellites during a period of interest. This could be early morning television, noon hour, or evening television, etc. Scan through each channel on the satellite to see what is being

broadcast. The video tape recorder should be recording as you scan the satellite channels (transponders). Write down the number on the tape recorder counter indicator when any material of interest to the class appears. This will make it easier to find material you want to highlight during classroom playback. Make notes on what is being broadcast in a particular segment of recorded material. Try to find some news, commercials, program previews, actual shows, and coverage of Parliament.

Classroom activity:

Tell the students that they are about to see what television is like in Canada. Ask them if they have ever seen television from another English speaking country. Ask them what differences/similarities might be expected in viewing broadcasts from America and Canada.

Play the tape recorded during a period of interest from the Canadian satellite. You may want to stop the tape at some of the places you noted during preparation to point out some interesting characteristics of Canadian broadcasting.

You may want to stop at a preview of a program to be broadcast at a later time. Ask the students to notice the characters in the preview. Do they remind them of anyone in our programming? Would they like to watch this program?

Advertising could also be viewed. Ask the students what products are being sold. Are the 30 second spot commercials similar to American network advertising? Is there a difference in the number of commercials - say during a news broadcast?

The viewing activity usually will take one classroom period.

After viewing several samples of Canadian television, have the students write a one page comparison of Canadian television and American television. Have them state examples of items being compared.

It might also be interesting to have the students observe the coverage of Canadian Parliament and the U.S. House and Senate and write a comparison of the coverage used here. The students may want to compare the Oliver North/Contra hearings with hearings in Parliament. They should make special note of the atmosphere and procedures in these meetings. Do the Canadian networks and American networks use the same techniques, for example, does the camera zoom in on only the person talking at the time?

Are the news programs similar? Are there differences in the formats of news programs? Do the anchor people appear to be similar? Are the views objective? Thorough? What about the background set; is it different?

To summarize this unit in the minds of the students, have them write their impressions of Canadian television. Have them state whether or not they would enjoy watching more Canadian television. Which do they prefer, U.S. network broadcasting or Canadian broadcasting?

Follow up activity

An interesting follow up activity would be to follow a world event, such as the arms talks, and compare the coverage from the Canadian and American networks.

USING SATELLITE BROADCASTING IN CURRENT EVENTS AND CIVICS

Greg Scott

Social Studies Instructor

Chetek High School

In the Social Studies courses such as Current Events and Civics, the satellite broadcasts are extremely valuable in giving the instructor an opportunity to acquire timely, often real time, information on current world and national events. Congress can be seen at work and special investigative hearings make for excellent examples of our representatives in action.

The satellite receiving station is an extremely valuable tool as far as making information available, but there is a definite problem in utilizing the information. An instructor can easily be intimidated by the great volume of information listed in the satellite T.V. guides. Some method must be developed to help instructors use the information on Congress and other news events. It is impossible at this time for a Current Events or Civics teacher to take advantage of all the satellite broadcast resources. The reason for this is the time required to review programming material collected during the sessions of Congress. For example, of the hours of testimony collected on a special investigative hearing, a classroom segment may use only a few minutes. The teacher must see all the testimony in order to find the few minutes needed to make a point in class.

From the view of a Current Events and Civics teacher, it is obvious that there is a tremendous resource in the satellite broadcasts. However, some method must be developed to help in

sorting program material and alerting teachers to possible programs of use. If this cannot be done, the full potential of the satellite broadcasts may not be realized.

Use of the satellite broadcast information in a classroom is still very valuable. For those districts in rural areas that have no access to cable or national networks, it would be invaluable. There is no substitute for seeing government in action and viewing principles being discussed in a Civics or Current Events class.

CURRENT EVENT LESSON PLAN USING SATELLITE BROADCASTS

THE IRAN-CONTRA AFFAIR

Greg Scott

Social Studies instructor

Chetek High School

Objective:

The overall objective of this unit is to help students gain an understanding of the Iran-Contra Affair. After viewing some of the investigative hearings the students will be able to list a minimum of four main characters along with their job descriptions and connection to the Affair. The students will also take part in a roundtable discussion concerning the Iran-Contra Affair.

Class time required

Approximately five class sessions.

Preparation time required

The preparation time will be from two to five hours, depending upon how much tape must be reviewed.

Classroom activity:

Introduce the Iran-Contra Affair to the class. Make note that certain elements of the Affair are so bizarre as to be almost unbelievable in a work of fiction. For example, Fawn Hall shredding documents, McFarlane delivering a cake and Bible to Iran's speaker of the parliament, Oliver North creating and leading his own posse of vigilante-types to rescue the contras.

Assignment: As the video tapes of the hearings are played, have the students make a list of the main characters involved,

noting their job descriptions and relationships to the President, and their activities in connection with the current crises. Students may also use magazines or newspaper articles as a resource. (See Time magazine, March 9, 1987, pp. 32-36)

Lecture: Note the countries involved and their political significance to the U.S.

Classroom A.V. viewing: Depict one aspect of the Contra crisis and the joint congressional hearing with the use of VCR taped material from the hearings broadcasts. Have the students take notes on the characters involved and the events they took part in.

Checking for understanding: Analyze and think critically by assigning individuals or groups of students to participate in a roundtable discussion that focuses on one or more of the following points:

a) The domestic political significance.

b) The foreign policy significance.

c) The legal aspect.

d) Constitution issues.

SATELLITE DISH USE IN SPANISH CLASS

Mike Persson

Spanish Instructor

Chetek High School

Introduction

The satellites usable in north central USA are Galaxy 1, channels 6 (Univision) and channel 20 (Galavision). The footprint of the Morelos bird is directed at Mexico and is barely visible let alone usable at the Wisconsin latitudes. The Galaxy stations, though, are bright and sparkle free.

Since the programming is oriented toward the American Hispanic viewer, nothing is simplified nor formalized as with prepared Spanish rental movies and books. The words are at normal conversational speeds with slang and double entendres frequent.

Taping

One way to preview available shows is to set the VCR timer for an initial taping time and let the tape run for six hours. To review, using fast forwarding, one can inspect shows and re-record any desired program segments. A program guide, such as the monthly ORBIT magazine, lists all the Spanish shows on the Galaxy 1 satellite.

Available programs

Movies

The program guide lists some 100 movies available per month. The best way to examine them since they can't be previewed

beforehand, is to tape them for later viewing. Some are old black and white Mexican cowboy movies and others are modern color comedies and adventure series. None are American movies with subtitles.

The dialog is fast and, except for the top-notch student, hard to assimilate. Comedians use words with double meanings which are lost completely by American students. They frequently end up just watching the action and tuning out the speaking. Some comic characters have silly voices that are impossible to understand.

Soap Operas

The majority of daily programs available on the G1 channels seem to be movies and soap operas. Spanish soap operas, like the English ones, are very verbal without a lot of action, supposedly exemplifying "normal" lifestyles. However, these seem to be mostly set in modern cities displaying upper class people suffering from melodramatic problems that hardly reflect a fair cross section of Latin-American people.

Of all programming, though, advanced students are frequently able to follow the soap opera dialog. Characters are portrayed at close range and with a minimum of background noise. The scenes change frequently so student attention can be more easily maintained.

The soaps are broadcast daily, although few teachers would spend class time trying to follow a series. An occasional glimps would be fine, especially if the kids think of it as a sort of forbidden treat. In a school with a less formal lock-step structure perhaps students could follow the soaps on their own

time or tape programs to be viewed at home on their own VCR's.

Cartoons

Saturday morning cartoons on Univision feature such serials as "El Capitan", "La Maquina del Tiempo", and "Conan". Although the students will at first be anxious to watch them, the dialogue is very difficult to follow. Most characters have phoney, squeaky, very affected voices that are indecipherable. Also, their animated mouths are not in sync with the words which further disrupts understanding. The students quickly get turned off and just watch the action.

Game Shows

There are a few game shows which are interesting, some asking questions and others of the "Gong Show" variety. The emcees speak very rapidly to keep the shows moving along which detracts from student comprehension, although they sometimes get a lot depending on the game being played.

Other Shows

Other program types which could be used in the classroom include music video shows although the performers and songs are unfamiliar to American students.

Another possibility is the daily newscast which, for students who are up on current events, could be meaningful.

Sports is another possibility for classroom use with such weekend events as boxing, auto racing, and soccer games.

Classroom Use

Shows taped from the satellite are worthwhile in the Spanish class for both entertainment as well as educational benefit. The

teacher should preview the show and if possible make a list of unfamiliar words and expressions. For a half hour show, however, the list could get quite long. The students could be given the list a few days before class and the words practiced, at least to the point of familiarity rather than for mastery.

At the end of the program the teacher could ask questions in either English or Spanish on the content of the show in order to check for understanding.

USING SATELLITE BROADCASTS IN MIDDLE SCHOOL

Steve Liker

Social Studies instructor

Chetek Middle School

The eighth grade Social Studies curriculum at Chetek Middle School consists of one semester covering American history, from exploration through the Revolutionary War, and one semester on the United States Constitution. We study the Constitution in its entirety. Then we concentrate on each of the articles and how our Federal and State Governments operate under the Constitution. The satellite broadcast information is used in teaching about the Constitution.

The satellite receiving system at Chetek offers us an opportunity to observe our government in action first hand. Our students can see the House and Senate in action. They can see how investigative committees work. The broadcast coverage from the House and Senate are very helpful in teaching students how government works. Most of our students will never personally see or hear the Senate or House of Representatives in action.

We have found other information available through the satellite, of great use in the classrooms. For example, a large number of our students are from rural farming areas. Many do not have an opportunity to view the news because it is televised during the hours when our students are busy in the barns or doing field work. The satellite broadcasts of Assignment the World and What's in the news are used during the school hours to allow

these students to keep up with current world events. Many programs on travel and cultures of other countries are also used in our Social Studies and World Geography classes.

SAMPLE LESSON PLAN USING SATELLITE TELEVISION

Eighth Grade Civics Class

Steve Liker

Social Studies instructor

Chetek Middle School

To introduce the Legislative Branch of our federal government we use the satellite television coverage of the House and Senate. The eighth grade Civics class viewed tapes of the opening of the 100th Congress to obtain information for the following general objectives:

1. To have students gain knowledge and understanding of how congress works.
2. To have students observe how the opening of a session of Congress is conducted in the House and Senate.
3. To be able to compare and contrast the proceedings in the House and Senate.
4. To have students observe how the leaders in each body are elected.
5. To have students learn who the leaders are and the House and Senate.

Objectives:

After viewing tapes of the opening sessions of the 100th Congress, students will be able to:

1. Know the duties of the presiding officers of the House and Senate.

2. Be able to name the presiding officers of each house.

3. Be able to name the Senate Majority and Minority leaders.

4. Know the duties of the Majority and Minority leaders.

5. Be able to name the Majority and Minority leaders in the House of Representatives.

6. Know the duties of the Majority and Minority leaders in the House of Representatives.

Materials:

Satellite T.V. on C-Span and C-Span II, video recorder, T.V. monitor.

Class time required:

This unit takes four sessions.

Preparation

Make video tapes of the opening session of the House and Senate. The House is recorded from C-Span and the Senate is recorded from C-Span II. Note places on the tape that shows the various leadership personnel of the House and Senate by writing down the tape counter numbers. Make notes to correspond with the events/personnel being viewed.

Classroom activity:

Day 1: Have the students view the tapes made of the opening session of Senate. The students should take notes of what they see. Stop the tapes to point out the names and duties of the various leaders. Point out the careful order of the proceedings. When the tape is finished, answer any questions the students have about what they have seen.

Day 2: Repeat the procedure used on day one only this time view the recording of the House of Representatives.

Day 3: Review the two days of viewing and hand out the work sheet (attached to this plan) for the students to complete. The students should use their notes to complete the work sheet.

Day 4: Have a quiz on the work sheet and objectives of this unit.

Follow up activities

Have the students look in current magazines and newspapers for articles and pictures concerning the leaders of Congress. Point out how much coverage is given to the leadership in Congress to that given members of each body.

The students may make booklets, bulletin boards and collages using their pictures and articles. Separate activities can be done for the House and Senate.

Knowing the leaders of Congress. Complete the following chart.

	Duties	Political Party	Home State
Name of Vice President			
Name of President Pro tempore			
Name the Senate Majority Leader			
Name of the Senate Minority Leader			
Name of the Speaker of the House			
Name of the Majority Leader in the House			
Name of Minority Leader in the House			

	Years in Office	Political Party
Name of Senior Senator from your state		
Name of Junior Senator from your state		
Name of Congressional Representative from your state		

Work sheet on Knowing the leaders of Congress.

USING SATELLITE BROADCASTS IN HIGH SCHOOL SCIENCE

Larry Miller

Science instructor

Chetek High School

The satellite receiving system is a natural subject for science classes. In addition to studying the science of a satellite system, the programming in the area of science is very plentiful. The satellite system at Chetek High School is used to teach the ninth grade science classes about applications of wave theory. It is ideal to have a system that shows students how broadcasting is done using spacecraft. The students can see the dish move and satellite signals fade in and out as scanning occurs. It is one way students can know that the satellites are in the sky without being able to see them.

The science programming available on satellite T.V. is very useful in bringing students up to date on what is happening in the world of science. Some of the programming is very exciting to them and makes for a good motivational tool.

On the negative side, it is frustrating to obtain science programming for use in the classroom. There is so much information on the satellite. It is impossible for a teacher to search through all the written material and or to view tapes of science programs. The search and view time conflicts with the time needed to perform normal daily tasks. It would help if there were a program guide for educators that would list the programs by subject area and present an abstract of the programs.

LESSON PLAN Sub-Unit: Satellite TV

COURSE Science CHAPTER OR UNIT Wave Energy TOPIC Satellite Orbit

Affective Aim: Appreciations, Understanding, etc.

Behavioral Objective, (Include condition, Criterion, and Terminal Behavior)

Be able to define, use, and/or recognize the following terms and facts pertaining to the communications satellite orbit.

LESSON MODEL

I. Anticipatory Set
Diag. Quest. & Prior Learning
II. Stated Objective
III. Input--
Stick with objective.
IV. Modeling-Demos, Examples
V. Ck for Understanding
Sampling, signals, Ind. private response
VI. Guided Practice
Do it; practice homework
VII. Independent Practice
Practice alone, home
VIII. Closure--
Tomorrow, Conclusion

CONTENT	Student Behavior	Teacher Behavior	Materials Needed	Time
Facts - 18 "Birds" over USA, each with 24 transponders (channels) possible. - sent up by various organizations - each has a name & nickname ex. Galazy 1 (G1) - All are in a region ~23,000 miles above the equator called the Clarke Belt. - Earth has a radius of ~4000 mi. - The Clarke Belt is the Orbit needed for a s satellite to match the earth's rotation. They are in synchronous orbit.	Take notes.	Lecture & Discuss.	Pictures - 1.) "charting the satellites" 2.) Clarke Belt	1½ Periods.

CONTENT (Con'd)

- * Each bird will "hang over" a specific longitude (ex. G1 -->134° W) said to be geosationary.
- Satellites are about 2° apart (800 mi.)
- * The Satellites have a period of 24 hrs./cycle just like the earth's surface.
- There are over 100 Satellites in the world satellite communication system.
- The orbit is in the southern sky about 23° elevation in N. Wisconsin.

Evaluation of Product	Assignment:
Evaluation of Process	

Sub-Unit: Satellite TV

LESSON PLAN

COURSE Science CHAPTER OR UNIT Wave Energy TOPIC Transmitting & Receiving Principles

Affective Aim: Appreciations, Understanding, etc. Energy can't be destroyed, but it can change forms. We change energy to fit our needs.

Behavioral Objective, (Include condition, Criterion, and Terminal Behavior)

Organize a scrambled list of equipment and components into the sequence used during the process of transmitting a studio scene to a TV screen via satellite. Also, from a separate list of energy changes, choose the energy change that would take place at each equipment site.

LESSON MODEL

I. Anticipatory Set
Diag. Quest. & Prior Learning
II. Stated Objective
III. Input--
Stick with objective.
IV. Modeling-Demos, Examples
V. Ck for Understanding
Sampling, signals, Ind. private response
VI. Guided Practice
Do it; practice homework
VII. Independent Practice
Practice alone, home
VIII. Closure--
Tomorrow, Conclusion

CONTENT	Student Behavior	Teacher Behavior	Materials Needed	Time
(See attachment)	Take Notes & discuss, Study Quiz with a partner.	Lecture & discuss.	Overhead transparencies of: 1.) Equipment sequence & energy change lists 2.) Sketch, showing equipment in sequence.	1½ hr. class 1 hr. prep

CONTENT (Con'd)

Evaluation of Product	Assignment:
	Learn the sequence.
Evaluation of Process	Quiz next class period.

TV PICTURE TRANSMISSION
(Abbreviated)

Equipment (Scene) -->	Energy Change (Light)
TV STATION	
1. Camera Lense	1. Light refraction
2. Photoelectric cell	2. Light --> electricity
3. Amplifier & Encoder	3. Increase current
4. Uplink Transmitter Dish	4. Elect. --> high frequency microwave (~6 G Hz)
(24,000 miles to Clarke Belt) - - - - - - - - - - - - - - - - - -	
BIRD	
5. Receiving part of Satellite transponder	5. ~ 6 G Hz wave ---> electricity
6. Transmitting part of Satellite transponder	6. Electricity ---> ~ 4 G Hz Wave
(24,000 miles to earth)	
STATION	
7. Downlink receiving dish	7. 4 GHz wave --> reflected & focused
8. Feed horn	8. Receives focused waves.
9. Low Noise Amplifier, Converter, & Receiver	9. Waves ---> Electric current: Current increased; frequency changed; signal "cleaned-up"
TV	
10. Picture tube (electron gun)	10. Current --> electron beam
11. Picture tube (Fluorescent screen)	11. Electron beam ---> light

LESSON PLAN Sub Unit: Satellite TV

COURSE Science CHAPTER OR UNIT Wave energy TOPIC The Space Craft (bird)

Affective Aim: Appreciations, Understanding, etc.

Behavioral Objective, (Include condition, Criterion, and Terminal Behavior)

Be able to define, use, and/or recognize the following terms and facts pertaining to the satellite space craft.

LESSON MODEL

I. Anticipatory Set
Diag. Quest. & Prior Learning
II. Stated Objective
III. Input--
Stick with objective.
IV. Modeling-Demos, Examples
V. Ck for Understanding
Sampling, signals, Ind. private response
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Tomorrow, Conclusion

CONTENT	Student Behavior	Teacher Behavior	Materials Needed	Time
- Satellite System is composed of: 1.) The Uplink system (earth transmitter, up signal, and satellite receiver) 2.) The Downlink system (satellite transmitter, down signal, receiving dish) - Powered by Solar Power supply; transmitter uses only about 5-8 watts of power. - Each bird has 24 transponders which receive & transmit 24 different signals thus creating 24 channels. - Each bird can receive and send 12 frequencies of vertical polarity and 12 of horizontal polarity to create 24 channels (two stations can use the same frequency so long as the wave polarities are different) - each bird creates its own "footprint" on Earth or area of TV reception. Users near center of f.p. can use smaller dishes.	Notes	Discuss & define terms.	Pictures - Footprint - Various Satellite shapes	30 min.

LESSON PLAN Sub-Unit: Satellite TV

COURSE Science CHAPTER OR UNIT Wave Energy TOPIC Present Use

Affective Aim: Appreciations, Understanding, etc.

Behavioral Objective, (Include condition, Criterion, and Terminal Behavior)

Be able to list or identify 10 different types of programming presently offered by Satellite TV and translate information provided by a satellite tv magazine.

LESSON MODEL

I. Anticipatory Set
Diag. Quest. & Prior Learning
II. Stated Objective
III. Input--
Stick with objective.
IV. Modeling-Demos, Examples
V. Ck for Understanding
Sampling, signals, Ind. private response
VI. Guided Practice
Do it; practice homework
VII. Independent Practice
Practice alone, home
VIII. Closure--
Tomorrow, Conclusion

CONTENT	Student Behavior	Teacher Behavior	Materials Needed	Time
Pass out copies of Orbit Magazine. Program sheet - Types found: Networks Religion Education Sports Music Government sessions Languages Art Business Home Shopping Radio News - Translate symbols & abbreviations used to describe a given program.	Take notes & contribute Study sample programming.	Give each student a sample page Discuss terms, abbreviations and apply to prior learning	Sample pages from ORBIT Magazine Satellite System Receiver	30 minutes

LESSON PLAN

Sub-Unit: Satellite TV

COURSE Science CHAPTER OR UNIT Wave Energy TOPIC Users of Satellite TV

Affective Aim: Appreciations, Understanding, etc.

Behavioral Objective, (Include condition, Criterion, and Terminal Behavior)

Be able to list different users of Satellite communications & give an example of how they may use it.

LESSON MODEL

I. Anticipatory Set
Diag. Quest. & Prior Learning
II. Stated Objective
III. Input--
Stick with objective.
IV. Modeling-Demos, Examples
V. Ck for Understanding
Sampling, signals, Ind. private response
VI. Guided Practice
Do it; practice homework
VII. Independent Practice
Practice alone, home
VIII. Closure--
Tomorrow, Conclusion

CONTENT	Student Behavior	Teacher Behavior	Materials Needed	Time
Examples: Home Businesses/Corporations (How?) Municipal (Fire & Police depts.) Education institutions Armed services Ethnic groups Farm Aviation — Weather	Make lists.	Glean responses from students.	Blackboard	15 min.

LESSON PLAN Sub-Unit: Satellite TV

COURSE Science CHAPTER OR UNIT Wave Energy TOPIC Future Use

Affective Aim: Appreciations, Understanding, etc.

Behavioral Objective, (Include condition, Criterion, and Terminal Behavior)

Be able to list possible future uses of Satellite TV.

LESSON MODEL

I. Anticipatory Set
Diag. Quest. & Prior Learning
II. Stated Objective
III. Input--
Stick with objective.
IV. Modeling-Demos, Examples
V. Ck for Understanding
Sampling, signals, Ind. private response
VI. Guided Practice
Do it; practice homework
VII. Independent Practice
Practice alone, home
VIII. Closure--
Tomorrow, Conclusion

CONTENT	Student Behavior	Teacher Behavior	Materials Needed	Time
Examples: TV to remote areas. Two-way communication World-wide education. Multiple choices of program subscriptions. Vehicle navigator Defense	Think & jot down ideas.	Wait for imaginative responses.	Blackboard	30 min.

CONTENT (Con'd)

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Evaluation of Product	Assignment:
Evaluation of Process	Write a paragraph describing how satellite communication may be used in the future. Be imaginative.

LESSON PLAN Sub-Unit: Satellite TV

COURSE Science CHAPTER OR UNIT Wave Energy TOPIC Home Receiving Station

Affective Aim: Appreciations, Understanding, etc.

Behavioral Objective, (Include condition, Criterion, and Terminal Behavior)

Be able to describe a typical home satellite receiving system using appropriate terms and definitions.

LESSON MODEL

I. Anticipatory Set
Diag. Quest. & Prior Learning
II. Stated Objective
III. Input--
Stick with objective.
IV. Modeling-Demos, Examples
V. Ck for Understanding
Sampling, signals, Ind. private response
VI. Guided Practice
Do it; practice homework
VII. Independent Practice
Practice alone, home
VIII. Closure--
Tomorrow, Conclusion

CONTENT	Student Behavior	Teacher Behavior	Materials Needed	Time
Terms: Parabolic Dish - - made of Al, fiberglass, wire screen - curvature is vital - Size: 6--20 ft. diam. Larger are more efficient & gather more waves. LNA (low noise amplifier) converts microwaves to current (millionth of a volt) and amplifies it by 100,000 times. Down converter - changes the 4 GHz frequency to 70 M Hz - Receiver - Reduces frequency from 70 MHz -> 30 MHz; Amplifies signal; discriminates audio & video signals, provides channel selection by turning dish toward desired satellite.	Take notes; Study & use the school's equipment.	-Notes -Describe components using diagrams. then demonstrate the school's Sat. syst. or have guest speaker (A-V Director)	- Pictures - Actual home receiving equipment - Overhead	1½ Periods.

CONTENT (Con'd)

- Satellite pointing
  Motor tips & rotates the dish to correct elevation degree & Azimuth (E-W) degree needed to "look at" a given satellite.

- Signal types received
  TV, scrambling, computer, and audio.

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Evaluation of Product	Assignment: Quiz on "Home Station"
Evaluation of Process	

FROM THE DESK OF THE INSTRUCTIONAL MEDIA SPECIALIST

Gary Mohr

Instructional Media Specialist

Chetek School District

I have district wide (k-12) responsibility for all library and audio visual materials used for instruction. I was excited to know we were going to receive new and exceptional instructional material via a grant for a Satellite Receiving Station. For a rural school this gave me a vision of many new instructional areas to explore and offer to our teachers and students.

I began my work by spending a number of hours each week with Mr. Adams, our project supervisor, familiarizing myself with the equipment we were using. The remote controlled Conifer XT-200 Satellite TV Receiver, located in my room at the Chetek High School, was the first item I had to master. The controls necessary to operate the satellite receiving system are as follows: East/West antenna (dish) scan control, skew, format, audio mode, scan, signal level, 24 channel selector, antenna control unit, signal level, and remote control unit.

Many hours were spent locating, setting, and programming the remote controller on the 16 plus satellites that we were receiving. There were more than 26 satellites in orbit at this writing. However, we chose to use the satellites with the most educational benefit to program into the remote control. This made it easy for our staff and students to find instructional programming. The receiver owners manual and the ORBIT magazine

were the two prime sources of information used to locate and identify the satellites. Other equipment that I needed to be familiar with was the dish on our school roof, a VCR (video cassette recorder), and T.V. This equipment enabled us to view and record program material from the system.

I recorded sample programming off each satellite and every channel that I could receive using the remote unit in our system. I used this recording to familiarize myself with programming and to inservice our teaching staff. I was able to show our entire teaching staff (39 people) different channels of possible instructional material. They were impressed. The satellite abbreviations were as follows: F1, G1, F3, AS1, T3, W5, S1, AD1, W4, T1, T2, F4, G2, and F2, all having the capability of up to 24 channels each. With the ORBIT magazine placed in the teachers lounge, requests began to come in to view and record off the satellite receiving system.

Forty-three blank video tapes were purchased to facilitate future needs for instructional material. We did not purchase a VCR or T.V. as the district A-V equipment was already available. However, it is highly recommended that a VCR and T.V. be dedicated to the satellite receiving station. Availability is a key factor. The system is on all day. There is a sign on the T.V. monitor indicating the "Satellite station of the day". For example the G1 satellite, channel 13, C-Span, which gives coverage of the House of Representatives. Another example might be satellite F3, channel 2, the Learning Channel. This station of the day concept creates interest and attracts attention to new learning material.

Community people in our rural area have also used the satellite receiving system, for example our City of Chetek Volunteer Fire Department. The Fire Chief came into my office one day with a letter he received from Washington, D.C. He requested that I tape a Fire Fighter Safety Seminar from 9:30 A.M. until 2:30 P.M one week day on EE NET, satellite S1, channel 1. I gladly did this for him and he replayed it for our rural volunteer fire fighters at a later date. Another example of community involvement was with the pastor of the Chetek Christian and Missionary Alliance Church. He had read in the denominations bi-weekly Alliance Witness magazine that their 100th Council Missionary Rally would be broadcast via satellite on CBN (Christian Broadcasting Network), satellite G1, channel 11. The recorder was set for the evening program and members of the congregation benefited from the replay of the broadcast.

Some tips and information

Make sure that you use fair use policies and read up on copyright laws.

Use the PBS channels on the W4 satellite. There are four channels which broadcast most educational programming at a wide range of times with repeat programming available. A perfect example of this is the program, What's in the News, a weekly series graded 4-6. This is broadcast at least 3 different times on two different days on satellite W4. Eyes on the Prize, a civil rights series is another example. Each program was one week ahead of the scheduled local network time.

Subscribe to a satellite T.V. guide such as Satellite ORBIT

magazine. This particular magazine costs less than $50 per year and is a great help in sorting out special programming. There are many other guides available; some are available for individual channels such as C-Span Update, and TDC The Discovery Channel (See Appendix A). A good way to find information on program guides is to watch for announcements or write to the channel that you need information on. Most have a toll free phone number to order guides.

Consider purchasing a descrambling device. A video cypher will cost between $375 and $500. This will descramble satellite signals from a station after subscribing to their services. Channels such as the Disney channel, WGN-Chicago, CNN Headline News have signals that require you to subscribe and have a descrambler. Subscription fees may range from as little as $15 per year to over $800 per year. Fortunately, most educational material is available at lower rates while the entertainment channels charge higher rates.

Finally, educate students with this new technology. Our district has an Audio-Visual class and an A-V Club. Both groups have been shown the satellite receiving system and know how to operate it. We are in a world of changing communications technology. The rural teacher and student now have the capability that any teacher and student living in an urban area have. The Chetek School District has utilized that technology. We have seen and felt its advantages.

APPENDIX A

Products mentioned in this handbook.

Satellite receiving station installed at Chetek High School:

Conifer Corporation
1400 Roosevelt
Burlington, Iowa 52601
Tel. 319-752-3607

ORBIT magazine - a satellite broadcast program guide:

CommTek Publishing Company
Division of CommTek, Inc.
P.O. Box 53
Boise, ID 83707

Other sources of information on satellite T.V.

The World of Satellite Television
By: Mark Long and Jeffrey Keating
Quantum Publishing 1983
Mendocino, California

A satellite Receiver Primer for Schools
Edited by: Ralph Whiting, Telecommunications Supervisor
Bureau for Instructional Media and Technology
Dr. Dianne McAfee Hopkins, Director

September 1984

Wisconsin Department of Public Instruction
125 South Webster St.
Box 7841
Madison, WI 53707

APPENDIX B

SATELLITE RECEIVING STATION FOR RURAL SCHOOL DISTRICTS

Excellence in Education Grants

Grant No. ERI-G-86-0015

Project No. 6-2409

FINAL REPORT

30 September, 1987

This is the final report on the Excellence in Education Grant entitled Satellite Receiving Station for Rural School Districts. The proposal for this grant was to install a satellite receiving station at Chetek High School, Chetek, Wisconsin. The satellite receiving station would be installed by students in the Metals shop class. The proposal called for teachers to draft some lesson plans using the information from the satellite receiving station. Finally, a handbook was to be made that would aid small rural school districts in purchasing and installing a satellite receiving station.

The original proposal was for a two year plan. The first year involved purchasing and installing a satellite dish and evaluating the program material for various subject areas. The second year would be used to develop a method for sorting and reviewing materials from the satellite broadcasts. Due to the large amount of applications received by the Department of Education, the grant was approved for the first year only.

After the grant was approved, it was necessary to change the funding profile to include more monies for hardware because the satellite dish would cost more than the percentage allowed by grant rules. A funding profile change was requested and approved.

The satellite system was purchased in October of 1986 at a local dealer from Hayward, Wisconsin. The entire package was shipped to Chetek High School directly from the manufacturer, Conifer, Corp., of Burlington, Iowa. The system was packaged well and arrived in perfect condition.

During the time it took for the system to arrive, a special mounting bracket was designed that would allow the parabolic dish to be placed on the gymnasium roof of the Chetek High School. The local building contractor was contacted for help to insure that the dish was mounted in a manner that would withstand the wind loading and do no harm to the building structure.

Assembly of the dish was done by the Metals class, under the direction of Mr. Robert Dewey. The instructions provided by the manufacturer were excellent and the students had no difficulty assembling the unit. Each member of the class of 15 students worked on the assembly. The Welding class constructed the

special roof mount for the dish.

The assembly took the class approximately one week during two hour class periods. After the dish panels were assembled and the mount was finished, they had to be hoisted to the roof for mounting. Northwest Roofers of Chetek, Wisconsin, donated the time and hoist necessary to lift the parts from the ground to the roof.

The Metals class drilled the holes in the building and attached the special mount. The parabolic dish was then assembled on the mount. This process took approximately 6 hours of class time. After the mechanical assembly was completed the dish drive motors were hooked up and tested. There were no problems in this area.

After the dish assembly was completed, the alignment procedures were started. This was the most difficult part of the project. Aligning a satellite dish is time consuming and takes patience. The time of year, November in Wisconsin, made it difficult to find nice days to work on the roof. The procedure is normally carried out with a satellite receiver and portable television placed next to the dish. This allows the signals to be monitored as the dish is scanned to various locations in the sky. The roof location prevented portable equipment from being used at the dish location. To align the dish at Chetek, walkie-talkies were used to communicate between our Media Center, were the satellite receiver was located, and the roof top. This increased the time required to finish aligning the system.

The alignment was finished by the third week in November. The next task was to find and identify all the satellites. This was done using the listings of all the satellites found in ORBIT magazine. This is also a lengthy procedure. The dish is scanned one satellite at a time from east to west. As each satellite was received, the receiver was tuned to each channel being broadcast. Any channels broadcasting educational information were noted. The satellites that would be used the most were programmed into the remote control of the satellite receiver. This way staff members could simply dial up a satellite and the dish would automatically scan to the proper location.

The satellite receiver, video tape unit, and television monitor were placed in the Audio Visual Center. Forty blank recording tapes were purchased and the Educational Media Specialist set up a tape reference system. A satellite location and identification chart were also placed next to the receiver. To aid the teachers in locating classroom material, an ORBIT magazine was placed in the teachers lounge.

To acquaint the staff with the capabilities of the satellite receiving system, an inservice was held. The Project Coordinator made a presentation on satellite broadcasting and told how the system at Chetek worked. The Instructional Media Specialist

explained what was available on the system and showed some taped samples from several satellites. He also presented information on how to use the ORBIT magazine.

After the teachers attended the inservice on the satellite receiving station, requests begin coming in for programs to be recorded. The opening of the 100th Senate and House of Representatives proceedings were recorded for the Middle School Government classes. The Communications class could watch Canadian television and compare to U.S. television. Special investigative hearings of the House and Senate were recorded. The English department found some old classic plays that could be used in Drama units.

There was disappointment in the Spanish department when it was discovered that the Morelos satellite from Mexico could not be clearly received at the Wisconsin latitudes. This Spanish speaking satellite broadcast would have given the Spanish class some good experience at listening and observing the language and customs in Mexico. However, there are other Spanish speaking channels on U.S. television satellites that can be used. It should be noted that Southern States in the U.S. will be able to receive these satellite broadcasts.

The local Fire Chief came to the high school with a request to record a satellite broadcast. He wanted to record a seminar on certain fire fighting techniques that was to be broadcast on the satellite. He had received a letter from Washington giving the exact time and satellite. The recording was made and the local volunteer fire department could take advantage of this training session at their evening meetings.

It became obvious, after a short time, that there was going to be a significant problem using the satellite programs in the classroom. The problem is not the quality of the programming but the quantity. The time required for a teacher to find and review material is great. For example, the ORBIT magazine typically has thirty to forty pages of movie listings, five to ten pages of specials, and over two hundred pages of regular program listings. There are some listings by categories, such as sports, movies, computers, etc. However, there are no listings categorizing educational programming.

To help with the sorting problem, subscriptions to programming guides for individual channels were ordered. The Discovery Channel has a guide that gives more details on programs offered. However, the program listings don't give enough detail for teachers to know if it is worth recording. The C-SPAN Update gives times and details of special programs and interviews. Here again, teachers do not know what is coming up in Congressional sessions on a daily basis. The only solution, is to record the entire days session of the Senate or House, replay it at fast forward, and try to extract the information applicable to the class. This takes more time than teachers have to spend. Most have one preparation period per day and are involved in extra

curricular activities after school.

The Educational Media Specialist has what is called "The Satellite of The Day" set up in the Audio Visual Center. Each day a different satellite is tuned in and played on the television monitor with a sign telling what satellite and channel is being shown. This is done whenever there is no recording being done for teachers. This way teachers are exposed to the various satellites and channels as they walk into the Audio Visual Center.

Teachers continue to use the satellite broadcasts. The amount of recording has decreased with time because they have learned to record only special events or programs they know will be useful in class. The searching for information has stopped due to the time element.

During the past year the Project Coordinator, Mr. Adams, has been presenting information on the satellite receiving station to various conferences and meetings. He has spoken to the Wisconsin Elementary Principals, State Teacher Conferences, and several technology fairs. The reaction has been very positive. Most rural school systems have not thought about using a satellite dish to enhance the quality of education.

The handbook was finished in the last week in September, 1987. It will be made available to any school in the nation for a cost of $2.00 to cover postage and handling. The local C.E.S.A. (Cooperative Educational Service Agency) has agreed to be a distribution center for Northern Wisconsin. Articles and handbooks are being sent to the Northwest United Educators for announcement in their news letter and the same material will be sent to the National Education Association for their news letter. Orders for handbooks will be handled by the District of Chetek and can be obtained by writing to:

Satellite Handbook
Chetek School District
1001 Knapp Street
Chetek, WI 54728

Conclusion

A satellite dish is a valuable asset to any rural school district. The there is much programming applicable to many subject areas. The volume of information on the satellite broadcast system is to great for teachers to search through to find information for classes. However, the capability to record and view realtime events and explore different language broadcasts and broadcasts from different countries far outweighs any problem of too much information.

The cost of a system is from $1500 - $3000 in 1987 dollars. The systems are easy to purchase and most school districts can find an appropriate site for a dish. The best system for school

use is one that has a remote control unit, similar to those used on standard television sets. Teachers can simply dial up a satellite and the dish scans to the proper location in the sky. There should be a dedicated video taping machine and television monitor at the location of the satellite receiver.

A satellite receiving station can be a successful class project. If the instructions from the manufacturer are well done, students can assemble a system in shop class. The alignment procedure is more complex and will require the help of teachers. Building a system at the school is an excellent way of getting students and staff involved in communications technology.

The program material obtained from the satellite broadcast system will benefit all students in the school system. There is material ranging from Elementary through College.

The school staff should be inserviced on the capabilities of the satellite receiving system. They should be made familiar with the operation of the system and what programming material is available.

Recommendations

There needs to be a clearing house for educational satellite broadcasting. The product of this clearing house would be a monthly educational program guide for satellite receiver owners. School districts could subscribe to this service. The greatest need is for categorized listings of educationally valuable programs. These programs should be reviewed prior to being recommended. Perhaps some kind of rating system for educational value could be established. Such a clearing house might use a satellite channel to broadcast program changes and highlights for educators. This would be very useful for keeping up with what is being done in the House of Representatives and the Senate.

It is also recommended that more rural school districts invest in a satellite receiver system. The potential for course offerings are unlimited. Many rural school districts cannot afford to teach certain courses due to a lack of qualified instructors or too few students. Satellite television could bring these courses to rural areas. There is a potential for States with large rural populations to offer the small school districts the same type of courses available in the large metropolitan districts.

James C. Adams

Technology Coordinator
Chetek SChool District
Chetek, WI 54728

NEWS RELEASE

APPENDIX C

SATELLITE RECEIVING STATION HANDBOOK FOR RURAL SCHOOL DISTRICTS

Chetek High School, Chetek, Wisconsin has been experimenting with satellite broadcast information in classrooms. The high school has a twelve foot diameter satellite dish mounted on the gymnasium roof and signals received from communications satellites are used in various classes. This is all part of a Federal Excellence in Education Grant Chetek received in the summer of 1986.

The project involved both staff members and students. Students in Industrial Technology classes assembled the parabolic reflector dish and made a special mount so it could be mounted on the gym roof. The students also assembled the dish on the roof and aided in final alignment.

The assembly and alignment took approximately four weeks working during class time. After the dish was aligned and all the satellites, approximately sixteen, were received, the dish was ready for use.

Teachers spent class time using transmissions from the satellites. The Communications class could see how news feeds were made by the networks. They could also do a comparison of the Canadian television system with the U.S. system. The Spanish classes could watch cartoons, game shows, movies, and soap operas in the Spanish language. The Current Events class could see what was going on in the Senate and House of Representatives. They could also monitor some of the investigative hearings. The Middle School Government class could see the opening of the 100th Congress and get to know the Senate and House leaders. They could watch their representatives speaking on various issues.

The Science classes use the satellite dish when studying about wave theory. They learn how television signals are transmitted into space and back to earth where they are received by the satellite dish. It makes the theory come to life when the students can see the dish scan across the sky and watch signals appear and disappear from satellite to satellite.

There is a great abundance of material applicable for classroom use from Computer information, to Economic information from Wall Street. The information is so great that teachers had a major problem of reviewing and sorting it for classroom use.

During the year the grant was in progress, a handbook was being developed. The handbook, entitled, Satellite Receiving Station Handbook for Rural School Districts is ready for distribution. It will aid rural schools in learning about the satellite broadcast system, determining requirements, purchasing, installing and using a satellite receiving station. Sample lesson plans and teacher comments are included in the areas of Communications, Spanish, Current Events, Middle School Government, and Science. There is also a section of comments and tips from the Instructional Media Specialist.

Because of the large amount of programs on the satellite broadcast system, all students at Chetek High School and Middle School are exposed to information obtained from the satellite receiving station. The cost of a satellite receiving system is approximately $1500 to $3000 depending upon installation conditions. This is a small cost for the amount of information available to teachers. The satellite receiving station is a great way to involve students and teachers in communications technology while improving the quality of education.

The handbook can be obtained by sending $2.00 for postage and handling to:

Satellite Handbook
Chetek High School
1001 Knapp St.
Chetek, WI 54728

INFO SENT BEFORE 12-08-95

APPENDIX D

PRELIMINARY INFORMATION ON A SATELLITE RECEIVING STATION

Chetek High School

Excellence in Education Grant Project

U.S. Department of Education

Available Video Programming that is applicable to education:

1. CSPAN and CSPAN II - carry the House of Representatives and Senate activities.

2. Numerous educational programs from Public Broadcasting System, Discovery Channel, and other commercial programming.

3. Foreign language channels, French from Canada, Spanish speaking channels, and Italian channels.

4. Computer Science information from various sources of programming - industrial and educational.

5. Historical films, plays, etc. from Arts and Entertainment channel.

6. Financial news and reports from financial networks.

7. NASA programming during missions.

Audio channel programming

In addition to the video programming there are many audio channels for stereo music etc. These channels specialize in Jazz, Big Band, Easy listening, and educational programming.

Satellite receiver considerations/specificaions

Make sure you have a good site to place a dish. There must be clear viewing into the Southern area of the sky. There should be no trees or tall objects within approximately 60 feet of the proposed dish location. The main thing is to make sure that the southern exposure to the sky is good - preferably horizon to horizon. To check, face south and look up approximately 45 degrees from the sothern horizon. Stretch your arms out so that they point East and West. If you can see the horizon over your hands as they are stretched out, you propably have an excellent site. If there are objects near the Ease or West horizon, you will have to check with a dish installer to see if they will interfere with the signals from the satellites. There should be no interference from microwave signals that may be transmitted near your site. Check with local dish owners for any problems they may have.

BEST COPY AVAILABLE

The larger the diameter of the dish, the more likely it will receive weak signals from satellites. It also allows for more error in pointing the dish. Recommend a 10 to 12 foot dish.

The receiver should have a remote control device similar to televisions and video tape machines. It should allow teachers to simply press a series of keys to locate a particular satellite.

A dedicated VCR (Video Cassette Recorder) should be located by the satellite receiver to record program material for evaluation.

There is a limit to the length of wire that can be used from the dish to the receiver - check with the dish installer/dealer.

Should consider a horizon to horizon scanning mechanism on the dish pointing drive. As more and more satellites are put in service they are spreading across the sothern sky from horizon to horizon.

COST of a complete system should be anywhere from $1500 to $3000 depending upon the size of the dish, the type of receiver, and the distance from the dish to the receiver. This cost should include installation. Additional costs may be caused by unusual installation requirements.

Other considerations

Plan on purchasing twenty to forty blank video recording tapes and, if one is not available continously, a tape recorder with plenty of recording sessions available in memory. The tape recorder should be able to record a minimum of 4 events in a daily session.

Plan on providing plenty of time for a person to review what programming is available on the satellites. It will take approximately 2 hours per day for a period of 10 to 15 days just to review what satellites are being received and what is on each channel. There are 24 channels per satellite times the number of satellites being received.

Plan for about $100 - $200 for subscriptions to programming guides such as Orbit magazine, CSPAN UPDATE, and the Discovery Channel guide.

Hold an inservice on the satellite system so that teachers can learn how to operate the receiver and recorder. They should be made aware of what is available on the system and how to request recording times.

Further information

We will be publishing a Handbook for Satellite Receiving Stations for Rural Schools at the end of July, 1987. If you wish a copy of this, Please send your name and address to:

James C. Adams
Technology Coordinator
Chetek High School
1001 Knapp St.
Chetek, WI 54728

Phone: 715-924-3136

Hope this information is of some help to you.

Sincerely yours,

James C. Adams